



A.D. 1873, 30th JULY. N^o 2581.

SPECIFICATION

OF

JOHN STEPHENS.

TREATING EXCRETA, &c.

LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,

PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY:

PUBLISHED AT THE GREAT SEAL PATENT OFFICE,

25, SOUTHAMPTON BUILDINGS, HOLBORN.

1874.



A.D. 1873, 30th JULY. N° 2581.

Treating Excreta, &c.

LETTERS PATENT to John Stephens, of Ryder Street, St. James', in the County of Middlesex, for the Invention of "IMPROVEMENTS IN THE TREATMENT OF EXCRETA AND IN MACHINERY AND APPLIANCES THEREFOR, PART OF WHICH MACHINERY IS APPLICABLE TO THE PREPARATION AND DRYING OF PEAT FOR FUEL."

Sealed the 17th October 1873, and dated the 30th July 1873.

PROVISIONAL SPECIFICATION left by the said John Stephens at the Office of the Commissioners of Patents, with his Petition, on the 30th July 1873.

I, JOHN STEPHENS, of Ryder Street, St. James', in the County of Middlesex, do hereby declare the nature of the said Invention for "IMPROVEMENTS IN THE TREATMENT OF EXCRETA AND IN MACHINERY AND APPLIANCES THEREFOR, PART OF WHICH MACHINERY IS APPLICABLE TO THE PREPARATION AND DRYING OF PEAT FOR FUEL," to be as follows:—

This Invention relates to improvements in the treatment of excreta and of peat for fuel and in machinery and appliances therefor, and

Stephens' Improvements in Treating Excreta, &c.

consists in filtering the liquid portion from the solid portion of the excreta in a vessel which is capable of being disconnected and reversed for discharging it of its solid contents. The vessel is arranged above the funnel shaped opening of a tube, the body of which is provided with a glass gauge, and with a connection fitted with a cock which can 5 be opened and closed when necessary.

There is a cock in the tube below the connection and this also can be opened when desired to allow the passage of the liquid to a kind of fan in combination with a Barker's mill, the draught from the blades of which fan draws off the evolved vapour and the ammonia and fixes them 10 into lime and into charcoal with which the casing is lined or charged. The moist excreta may however be filtered by a syphon tube provided with cocks and glass gauge; the tub or vessel in which the solid excreta is placed is capable of being reversed for the discharge, the filtering tube moving with the tube having a flexible pipe attached for the 15 purpose.

The effluent or escaping water from the mill passes from the mill back to the collecting tank to be amalgamated with fresh excreta, in order to bring it to the proper consistency for pumping it up to the filtering medium. 20

The excreta may also be treated with clayey water under pressure to impregnate the body with clay.

The fan and the mill portion of the casing are divided, the arms being at the bottom, so that the streams or jets if forced against a serrated wall become broken up into spray to free the ammonia which with the 25 rising vapour passes through a contracted opening to be acted upon by the fan blades and the lime and the charcoal as before explained.

The solid excreta is passed through rollers to squeeze the air from, and also to partially dry it and also into a chamber into which carbonic acid gas is forced, so that it becomes charged therewith, the carbonic acid gas 30 being preferably obtained from peat when in a crude or a semi-prepared state by heat. The excreta thus charged is then mixed with the charcoal impregnated with ammonia and thoroughly amalgamated there with the compound, forming a valuable manure. The mixture or compound is afterwards packed in sacks lined with fresh charcoal to prevent escape 35 of the ammonia.

Stephens' Improvements in Treating Excreta, &c.

The charcoal which takes up the ammonia is in a powdered state and it is ground while red hot in close vessels, the vessels being double, with a flow of water between to keep them cool.

The apparatus for filtering and for extracting the ammonia and vapour
5 before explained are applicable for the treatment of peat, which is, when first obtained, first put into a cylinder with a quantity of clayey water ; a pressure is then put upon it to thoroughly impregnate the pores of the fibres of the peat with water and clay to destroy their tendency to expand ; after the filtering and pressing operation as explained for the
10 excreta is performed the clay with which the pores become charged forms the means of binding the fibres, and prevents them expanding as they would otherwise do.

The excreta, if it is to be compressed into blocks for transport, is first finally pressed and placed in trucks or on a travelling belt, and is passed
15 through a heated chamber. This chamber is of tubular form and is surrounded for a portion of its length with a rotating body to produce heat by frictional contact, the exterior rotating body being operated by a water wheel or other power from natural or artificial sources.

This heating chamber can be employed for the drying of the peat
20 whether made up into blocks or otherwise.

SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said John Stephens in the Great Seal Patent Office on the 30th January 1874.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOHN
25 **STEPHENS**, of Ryder Street, St. James', in the County of Middlesex, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Thirtieth day of July, in the year of our Lord One thousand eight hundred and seventy-three, in the thirty-
30 seventh year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said John Stephens, Her special licence that I, the said John Stephens, my executors, administrators, and assigns, or such others as I, the said John Stephens, my executors,

Stephens' Improvements in Treating Excreta, &c.

administrators, and assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for “IMPROVEMENTS IN 5 THE TREATMENT OF EXCRETA AND IN MACHINERY AND APPLIANCES THEREFOR, PART OF WHICH MACHINERY IS APPLICABLE TO THE PREPARATION AND DRYING OF PEAT FOR FUEL,” upon the condition (amongst others) that I, the said John Stephens, my executors or administrators, by an instrument in writing under my, or their, or one of their hands and seals, should particularly 10 describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date of the said Letters Patent.

NOW KNOW YE, that I, the said John Stephens, do hereby declare 15 the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the Drawings hereunto annexed, that is to say:—

This Invention relates to improvements in the treatment of excreta 20 and of peat for fuel, and in machinery and appliances therefor, and consists in filtering the liquid portion from the solid portion of the excreta in a vessel, which is capable of being disconnected and reversed for discharging it of its solid contents. The vessel is arranged above the funnel-shaped opening of a tube, the body of which is provided with 25 a glass gauge, and with a connection fitted with a cock, which can be opened and closed when necessary.

There is a cock in the tube below the connection, and this also can be opened when desired to allow the passage of the liquid to a kind of fan in combination with a Barker's mill, the draught from the blades of 30 which fan draws off the evolved vapour and ammonia and fixes them into lime and into charcoal, with which the casing is lined or charged. The moist excreta may however be filtered by a syphon tube provided with cocks and glass gauge. The tube or vessel in which the solid excreta is placed is capable of being reversed for the discharge, the 35 filtering tube moving with it, the tube having a flexible pipe attached for the purpose.

Stephens' Improvements in Treating Excreta, &c.

The effluent or escaping water from the mill passes from the mill back to the collecting tank to be amalgamated with fresh excreta in order to bring it to the proper consistency for pumping it up to the filtering medium.

- 5 The excreta may also be treated with clayey water under pressure to impregnate the body with clay.

The fan and the mill portion of the casing are divided, the arms being at the bottom, so that the streams or jets if forced against a serrated wall become broken up into spray to free the ammonia, which, with the
10 rising vapour passes through a contracted opening to be acted upon by the fan blades, and the lime and the charcoal, as before explained, but without allowing the ammonia to escape into the atmosphere.

The solid excreta is passed through rollers to squeeze the air from it, and also to partially dry it, and also into a chamber, into which carbonic
15 acid gas is forced, so that it becomes charged therewith, the carbonic acid gas being preferably obtained from peat when in a crude or a semi-prepared state by heat. The excreta thus charged is then mixed with the charcoal impregnated with ammonia and thoroughly amalga-
mated therewith, the compound forming a valuable manure. The
20 mixture or compound is afterwards packed in sacks lined with fresh charcoal to prevent escape of the ammonia.

The charcoal which takes up the ammonia is in a powdered state, and it is ground while red hot in closed vessels, the vessels being double, with a flow of water between to keep them cool.

25 The apparatus for filtering and for extracting the ammonia and vapour, before explained, are applicable for the treatment of peat, which is, when first obtained, first put into a cylinder with a quantity of clayey or tarry water, a pressure is then put upon it to thoroughly impregnate the pores of the fibres of the peat with water or clay, to destroy their
30 tendency to expand after the filtering and pressing operation, as explained, for the excreta is performed; the clay with which the pores become charged forms the means of binding the fibres and prevents them expanding as they would otherwise do.

The excreta, if it is to be compressed into blocks for transport, is first
35 finally pressed and placed in trucks or on a travelling belt, and is passed through a heated chamber. This chamber is of tubular form, and is

Stephens' Improvements in Treating Excreta, &c.

surrounded for a portion of its length with a rotating body to produce heat by frictional contact, the exterior rotating body being operated by a water wheel or other power from natural or artificial sources.

This heating chamber can be employed for the drying of the peat, whether made up into blocks or otherwise. 5

The Invention will be well understood by reference to the accompanying Drawings, and to the following detailed description thereof:—

A, A, Figure 1, represents a cylinder hung upon pivots p, p , which allow of the cylinder being turned over to empty out the solid fœcal matter, after the fluid part has been filtered off by atmospheric pressure 10 through the moveable filter F, F, in the bottom of the cylinder A, A, A. The filtered liquor passing out through the pipe T, T, T, joined to the hose or flexible tube H, H, which conveys the fluid to and turns a Barker's mill which is in combination with a fan; t^1, t^1 , is a bent tube ending in a funnel f , and communicating with the tube T, T, T, 15 so as to supply any fluid up to the top of the filter F, F, in the cylinder A, A, A, by opening the cock C^1 in the tube T^1, T^1 , and closing the cock C in the tube T, T, T. Then by closing the cock C^1 and opening the cock C the atmospheric pressure will filter the fluid from the solid matter in the cylinder A, A, A, by pressure through the 20 tube T, T, T, and hose H, H, to turn the Barker's mill combined with an exhausting fan. A glass tube is fitted to show when the fluid has all been filtered from the solid matter and then to close the cock C in the tube T, T, T.

A, A, A, Figure 2, also represents a cylinder hung on pivots p, p , at 25 the bottom of which cylinder is fitted the filter F, F, joined to the tubes T, T, T, part of which is a glass tube G, G. A funnel F^1 with stop-cock C^1 supplies fluid to fill the filter F, F, and when the cylinder A, A, A, is filled with fœcal matter and sewage, then by closing the cock C^1 and opening the cock C the fluid will be forced through the 30 fœcal matter and filter F, F, and then through the tubes T, T, T, and the hose H, H, fastened on the bent tube T, T, T, to turn the Barker's mill, combined with an exhaust fan as before explained, which separates the ammonia from the sewage fluid by dashing it into fine spray, the ammonia being absorbed by the charcoal (ground) or other known 35 absorbent, the vapour is absorbed by dry lime. I prefer this latter plan to the other because it would be less costly to make and can be easily

Stephens' Improvements in Treating Excreta, &c.

claimed. The bottom of the cylinder can be made of iron, the rest of wood if desired. This construction can be used for all sorts of rapid filtering of say water, coffee, and chemicals, in addition to sewage and water from peat.

5 M, M, Figure 1, is a Barker's mill combined with fan blades F¹, F¹, which draws up the ammonia liberated from the sewage spray dashed by the Barker's mill against the corrugated surface in the box B, B. The sewage then falls to the bottom and runs out by the syphon S and by a tube back again into the mixing tank from which the foecal matter
10 and sewage water was first pumped up into the cylinders A, A, A. The box B¹, B¹, contains trays T¹¹, T¹¹, T¹¹, of charcoal and lime to absorb the ammonia and the vapour evolved from the sewage spray. The hose from the cylinder A, A, A, is fitted on at the tube T³, T², with a stop-cock to turn the sewage water on and off from the Barker's
15 mill. L, L, are lids of the box B¹, B¹, to place in trays and take out.

The charcoal, if charcoal be used as an absorbent of the ammonia, is preferably reduced to powder while in a hot state and fresh, and in Figure 3 I show the description of grinding mill I employ for the purpose. The mill for grinding the charcoal or peat while burning is
20 like a common coffee mill, only with water running through the grinding cylinders A from the water funnel W, F; J, J, is a water jacket round the hopper H of the mill; H¹ is the handle to turn the mill while the water falls out at W. As soon as the charcoal is ground it can be put on the trays in the box B¹, B¹.

25 T⁵, T⁵, is a tube to conduct the carbonic acid off to mix with the dry foecal matter to preserve it and make it into rich manure.

Process of Manufacturing Manure from Foecal Matter of Towns and other Populous Places.—The foecal or manurial matter is first placed in a closed tank with revolving rakes or plain rake stirrers to mix
35 the matter with sufficient water to make the mixture fit for pumping up into the filtering cylinder A, A, A; when the cylinder is full, then by turning the lower cock C the water is at once driven through the foecal matter with a force of atmospheric pressure in proportion to the height of the cylinder from the ground. The cylinder can then
30 be tilted over and emptied of the solid matter on to some suitable drying stages, or passed through rollers, such as are shown in Figure 4, to further squeeze the moisture out of the matter. The process of

Stephens' Improvements in Treating Excreta, &c.

tilting the cylinder is accomplished by allowing plenty of slack hose at the end of the pipe of the filter. The fluid sewage can then flow through the hose to turn the Barker's mill, as before described. The fluid can be first filtered into a tank about 15 feet below the cylinder, and from thence it can flow down through the hose 15 feet more 5 to turn the Barker's mill and fan, as before described; by this plan, if the intermediate tank is large enough the Barker's mill can work all night by itself, giving out and absorbing ammonia in the charcoal trays; this plan will save a great deal of labour. The manurial products of fluid sewage and the solid can be mixed together, or with any other 10 manurial matter in sacks, as described. The carbonic acid evolved from the grinding of the charcoal red hot or peat can be forced into the solid foecal matter by a fan, which will greatly enhance its value. As all the filtration is done in closed vessels no waste of ammonia occurs; also as the fluid sewage after being dashed into fine spray and 15 evolving ammonia the fluid then flows back again into the mixing tank to be remixed with a lot of fresh foecal matter, so little or no ammonia is lost by this filtering process.

Figures 5 and 6 show an apparatus for producing heat by the rapid friction of a wooden or a metal jacket of boards (joined together by 20 springs) on the outside of an iron cylinder which will hold peat or manure to be dried. The cylinder A^1, A^1 , is a long iron cylinder placed horizontally, in which can be placed trucks or trays, as in Figure 11, containing manure or peat to be dried. J^1, J^1, J^1 , are boards joined together by spiral springs s, s, s , which form a jacket around 25 the cylinder A^1, A^1 , the springs causing a certain amount of pressure on the cylinder A^1, A^1 . This jacket is attached by two iron rods to a crank c which is turned by any water wheel which causes a rapid motion of the wooden board jackets J^1, J^1, J^1 , on the cylinder A^1, A^1 , thereby producing a certain amount of heat by the friction of the wooden 30 jacket on the iron cylinder A^1, A^1 , where water power can be cheaply obtained; this will be a cheap method of obtaining heat.

The cylinder and wooden jacket for obtaining heat can also be made with the jacket to revolve around the cylinder, as in Figures 7 and 8, by attaching a cog wheel at the ends of the jacket instead of having the 35 jacket to slide backwards and forwards on the cylinder from the action of the attached crank turned by a water wheel.

Stephens' Improvements in Treating Excreta, &c.

Figure 9 represents an apparatus for preparing and making peat fuel, which apparatus is also applicable to the manufacture of manure, with a slight modification in the Barker's mill fan combined used in making manure. A, A, is a cylinder turning on the pivots p, p , to which there can be placed a covered top T^6, T^6 , fastened water-tight by clamps to the cylinder A, A. To the top is affixed a forcing pump P^1 which condenses the water in the cylinder, causing a great hydraulic pressure on the peat and soddens it, which at once destroys the fibrous and elastic properties in the peat, which peat may be saturated with tar water or clay water, or other mixture, as may be deemed most expedient. When the peat has been submitted to this hydraulic pressure the peat and tar water can be emptied into the cylinder, described with reference to Figure 1, where the water can be readily separated from the peat, and in its fall will turn the Barker's mill and fan combined, which by the current of air produced will assist in drying the peat. The air in this case will be drawn from the top of the box B^1, B^1 , it having no air communication with the lower box B, B.

In the plan Figure 10 the Barker's mill revolves in the box B, B, without a corrugated circle, the water escaping by the pipe p^1 . The tube T, T, is attached to the hose H, H, which is attached to the filtering cylinder A, A, A. The fan draws the air from above at a, a , and drives it in the direction a^1, a^1 , in a circle to dry the peat bricks. The air at a, a , can be supplied by a pipe from the outer air if desired.

The apparatus for packing the manure in sacks is thus constructed:— Into the sack S^1, S^1 , Figure 12, is placed some charcoal (fresh) at the bottom. Then the outer cylinder A^2 , and then inside of that the cylinder A^1 , into which is placed the manure. Then between them is placed a layer of fresh charcoal or any other absorbent. The space between them is kept evenly all round by the guards g, g . The cylinders can then be taken out, and the sack is packed with manure.

What I claim as new in the treatment and manufacture of manure from the foecal matter of towns and other populous places are,—

Firstly. Quick filtering by atmospheric pressure by an apparatus that can easily be put into action after each discharge of the foecal matter and from a cylinder, substantially as set forth and shown.

Stephens' Improvements in Treating Excreta, &c.

Secondly. Filtering sewage matter by a plan which allows but little of the gases to escape from the manure, this being done with but little exposure to the atmosphere of the fluid after being filtered by the cylinder A, A, A, as set forth.

Thridly. The use of the filtered fluid to turn a Barker's mill and fan, 5 which draws up the evolved ammonia and vapour from the fluid sewage dashed into fine spray, and their absorption by charcoal or peat ground red hot (and dry lime) in a closed box or vessel, as described.

Fourthly. The special construction and method of action of the filtering cylinders, which swing upon pivots, with plenty of slack hose attached 10 to the cylinder to tilt out the solid manure after the sewage water has been filtered from it, without stopping the work of the fan.

Fifthly. I claim the employment of an intermediate tank between the filtering cylinders and the Barker's mill and fan evolving ammonia, by which the Barker's mill and fan can continue to work by itself, or when 15 the other parts are not at work, as set forth.

Sixthly. I claim the employment of the mill described and shown to grind burning or hot charcoal or peat, in which the carbonic acid evolved is stored, and the use of such impregnated charcoal when mixed with manure for fertilizing properties. 20

Seventhly. The special method of packing the manure, mixed with carbonic acid by the plan described and shown in the Drawings.

What I claim to be original and novel in the Invention for making peat fuel are,—

Firstly. Submitting peat to hydraulic pressure in a closed cylinder 25 containing clayey or tarry liquor, as described, by which the peat is at once soddened and converted into a pliable homogeneous mass, and by which all the elastic nature of the fibre becomes destroyed, and all the air and other gases are driven out and replaced by the fluid mixture in the cylinder, without going through the process of cutting up and making 30 the peat into pulp, as formerly.

Secondly. The treatment of peat after being submitted to hydraulic pressure, as set forth, whereby nearly all the water can be separated from it by filtration in the manner before described with reference to the filtration of manure, and so that the peat can be emptied out of 35

Stephens' Improvements in Treating Excreta, &c.

the cylinder on to drying stages, or passed through rollers, as are now used.

Thirdly. I claim the use of the filtered fluid from the peat in the same way as in the manure process to turn a fan which will drive a current of 5 air to help to dry the peat, as described.

Fourthly. I claim the production of heat by water power through the medium of the friction of an outer jacket (joined together by spiral springs, which causes a pressure on an iron cylinder) being moved rapidly to and fro by a crank action produced by a water wheel, which 10 will (as described) for drying solid manure produce heat to dry the peat, whether such outer jacket be made of wood or metal, as described.

I also claim the production of heat by a revolving jacket upon and against the cylinder, as described, and substantially as and for the purpose set forth.

15 In witness whereof, I, the said John Stephens, have hereunto set my hand and seal, this Twenty-eighth day of January One thousand eight hundred and seventy-four.

JOHN STEPHENS. (L.S.)

LONDON :

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty. 1874.



